EFFECTIVENESS OF TASK ORIENTED SWISS BALL TRAINING ON TRUNK CONTROL AND FUNCTIONAL BALANCE IN PATIENTS WITH MCA STROKE

Dissertation submitted to The Tamil Nadu Dr. M.G.R. Medical University towards partial fulfillment of the requirements of **MASTER OF PHYSIOTHERAPY (Advanced PT in Neurology)** degree programme.

KMCH COLLEGE OF PHYSIOTHERAPY

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CERTIFICATE

This is to certify that the dissertation entitled **EFFECTIVENESS OF TASK ORIENTED SWISS BALL TRAINING ON TRUNK CONTROL AND FUNCTIONAL BALANCE IN PATIENTS WITH MCA STROKE** is a bonafide work done by **RAJKUMAR.M.P** bearing the **Register No: 271720085,** KMCH College of Physiotherapy, towards partial fulfillment of the requirements of the **Master of Physiotherapy (Advanced PT in Neurology**) of The Tamil Nadu Dr.M.G.R Medical University, Chennai -32.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

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BACKGROUND: Stroke is defined as the immediate loss of neurological function caused by an interruption of the blood flow to the brain or the rupture of blood vessels in the brain. Trunk control is one of the most important indicators of functional recovery after stroke. Any weakness or increased tone in trunk muscles, increase in postural sway, failure of dynamic stability and difficulties in transferring weight all negatively affect the activity performance of patients with fine trunk control and proper weight transfer it is possible to secure and protect the body's upright posture and also in maintaining balance. Trunk rehabilitation initiated as early as possible less than 30 days was found to be most effective than later. In the task oriented swiss ball training approach movements are carried out as an interaction between many systems in the brain and is organized around goal and constrained by the environment. This training particularly works in helping to develop gross motor skills, postural stability, trunk control, balance and coordination

OBJECTIVE: To study the effectiveness of protocol based rehabilitation to improve pain, range of motion and quality of life in patients following Total knee replacement.

METHODOLOGY: Quasi-experimental research design with purposive sampling was used. Study setting was at KMCH Coimbatore. Eighteen patients were allocated in the study and 10 patients in each group. Group A received Task oriented swiss ball training whereas Group B received the conventional physiotherapy treatment. Posttest measures were taken after 6 weeks of training. The training was supervised programme.

OUTCOME MEASURES: Trunk control was assessed using Trunk impairment scale and Functional balance was assessed using Berg balance scale.

RESULTS: The data were analyzed using independent't' test and paired't' test at 5% level of significance. The pretest mean value showed that there is no significant difference between two groups and posttest mean value showed improvement in functional balance. Values of trunk control were decreased after training in group A than in Group B.

CONCLUSION: This study concluded that Task oriented Swiss ball training are effective to improve trunk control and functional balance among the patients with MCA stroke.

KEYWORDS: Trunk control, functional balance, task oriented training, swiss ball training, berg balance scale, trunk impairment scale

INTRODUCTION

1. INTRODUCTION

Stroke is a neurological disorder which causes damage to brain.It is a major health problem which needs a significant rehabilitation programmme.Stroke is also known as cerebral vascular accident or brain attack or apoplexy.

Stroke is one of the major health care issues that predominantly affect adult population which results in serious functional limitation and disability. Even in developed countries, stroke is found to be third most common cause of long term impairments, activity limitation and increased dependency.

The disturbance of cerebral function is caused by three morphological abnormalities (i.e.., stenosis, occlusion or rupture of the arteries). The Prevalence of stroke in India was estimated as 203 per 100,000 population over 20 years, amounting to a total of about 1 million cases.

The definition for stroke by world health organization (WHO) is “Rapidly developed clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin”.

The most commonly affected artery in Cerebero vascular accident is Middle Cerebral Artery.

Middle Cerebral Artery Stroke is the sudden onset of focal neurological deficit resulting from brain infarction (or) ischaemia in the territory supplied by the MCA.The areas supplied by the MCA are trunk,arm and head.

Trunk control is one of most important indicators of functional recovery after stroke. Any weakness and/or increased tone in the trunk muscles,increase in postural sway, failure of dynamic stability and difficulties in transferring weight all negatively affect the activity performance of patients. With fine trunk control and proper weight transfer it is possible to secure and protect the body in an upright posture.

In the Task Oriented approach,movement emerges as an interaction between many systems in the brain and is organized around a goal and constrained by the environment.It

includes a wide range of interventions such as treadmill training ,swiss ball training , gait training on the ground,bicycling program,endurance training and circuit training ,sit to stand exercise,reaching tasks for improving balance.

Swiss ball is a soft elastic ball with diameter approximately 35 to 85 cms (14 to 34 inches) filled with air.Swiss ball training is often used exercise,physicaltherapy,athletic training. It can also help in developing gross motor skills ,postualstability,trunkcontrol,balance and bilateral coordination.Swiss ball therapy is now being widely accepted to improve the overall function of the stroke patients.With its unstable surface,swiss ball therapy may result in greater level of muscle activation of work,compared to the stable surface and augment improvement in Trunk control and functional balance.

1.1 OPERATIONAL DEFINITION:

TRUNK CONTROL: Trunk control is the ability to control the upper part of the body (TORSO).It is important to hold the upper body in a upright position when sitting or moving.

TRUNK BALANCE: Trunk balance isthe ability to maintain postural control of the trunk including the shifting &bearing of weight on side to force on extremity for particular function such as reaching and grasping.

FUNCTIONAL BALANCE: Functional balance is the integration of static and dynamic balance training to maintain (or)to improve the Activities of Daily Living(Quality Of Life).

STATIC BALANCE: Static balance is the ability to maintain a particular position.

DYNAMIC BALANCE: Dynamic balance is the ability to maintain stability with changing conditions of body movements and requires small adjustments to maintain a position over base of support with any movement.

TASK ORIENTED TRAINING: Task Oriented training is a goal directed training & functional task practice instead focusing on impairement reduction exercise.It involves

predecting real life tasks with the intention of acquiring or requiring a skill defined by consistency, flexibility & efficiency**.**

SWISS BALL TRAINING : Swiss ball training is the training used in exercise, physical therapy, athletic training .It helps in developing gross motor skills ,postural stability,trunkcontrol,balance and bilateral coordination.

1.3 NEED FOR THE STUDY:

There are evidence for the effectiveness of task oriented swiss ball training in stroke rehabilitation. Mostly during stroke rehabilitation the trunk rehabilitation is being negelected. Many studies are done on effectiveness of task oriented training on the chronic stage of stroke patients. So,I conduct this study on acute stage of stroke patients by appling the techniques in trunk rehabilitation and findout whether the technique is effective.Since the studies have positive outcomes in trunk rehabilitation of chronic stroke,this study will help us choosing the better rehabilitation protocol.

REVIEW OF LITERATURE

2.REVIEW OF RELATED LITERATURE

2.1 PREVALENCE OF STROKE :

- **SURESHKUMAR KAMALAKANNAN** et al (2017) conducted a study to findout the incidence and prevalence of stroke in india; there has been more than 100 per cent Increase in incidence of stroke in low and middle income countries including india from 1970-1979 to 2000-2008.The result of the study interprets the cumulative incidence of stroke ranged from 105 to 152/100000 persons per day and the crude prevalence of stroke ranged from 44.29 to 559/100000 persons in different parts of the country during the past decade.

2.2 STUDY ON TASK ORIENTED TRAINING:

- **JIN UK CHOI** et al.,(2015) the study was conducted on 20 patients with stroke and they were divided into two groups: 10 patients were assigned for experimental group they participated in task oriented program and 10 patients were assigned into control group they receive traditional rehabilitation therapy for 4 weeks .As the result of the study they suggested that task oriented training program is a effective intervention to improve balance ability, ADL performance and self efficiency in stroke patients.The level of significance is $p<0.05$ for the result of Wilcoxon signed rank test before and after the changes in BBS, MBI and SES scores. The level of significance is $p<0.01$ for the result of Mann-Whitney U test before and after the changes in BBS, MBI and SES scores.
- **BO HYUN KIM** et al.,(2011) the study was conducted on 20 patients with stroke and they were divided into two groups: experimental group with 10 patients were made to perform the task oriented training (3 times per week) and received general physical therapy (5 times per week) for four weeks, and control group with 10 patients were made to perform only general physical therapy (5 times per week) for four weeks .As the result of the study, the experimental group showed significant improvement in trunk control ability, balance and gait after 4 weeks of task oriented training.The level of significance for TIS for the intervention between the experiment and the control group is $p<0.05$

- **MARIJKE RENSIK** et al .,(2009) the study was conducted as a case report study as a overview of the evidence in literature on task oriented training.As the result of the study they proved that task related training showed benefits for functional outcome compared with traditional therapies.

2.3 STUDY ON SWISS BALL TRAINING:

- **KANIKA D. MUNIYAE** et al (2018) the study was conducted on 40 subjects of post-stroke patients were divided into two groups by using convenient sampling method ;experimental group with 20 patients received swiss ball training and control group received conventional physiotherapy.By using Graph Pad version 3.0, the considered p value for BBS & TUG was > 0.05 where they obtained value was $p < 0.0001$, which is statistically significant.And they concuded the study that Effect of Swiss ball training & conventional physiotherapy was effective to improve balance & mobility and also showed a better quality of life in post stroke patients.
- **AKSHATHA NAYAK** et al.,(2012) the study was conducted on 17 patients among them5 were excluded because of recurrent stroke and 12 subjects were assigned for study group with the treatment of conventional rehabilitation program and 10 hours of additional Swiss ball exercise over a period of 3 weeks .As a result of the study posttest results show a significant improvement was seen in dynamic balance and coordination subscales.The level of significance for the trunk coordination subscales and trunk impairement scale is P=0.002
- **S.KARTHIKBABU** et al.,(2010) the study was conducted on 30 patients with acute stroke and they were divided into two groups; experimental group with 15 patients were treated with task specific trunk exercises on Swiss ball and control group with 15 patients were treated with task specific trunk exercises on stable surface for 3 weeks and the result of the study suggest that the experimental group improved more significantly than the control group.The level of significance was set at $P < 0.05$.
- **DAS** et al (2016) conducted a 5 weeks study on Trunk Rehabilitation Program including supine exercises, sitting exercise and Swiss ball exercises, clinically show a significant improvement in trunk control and dynamic sitting balance in acute hemiparetic patients. Trunk rehabilitation programme shows statistically increased scores of TIS and forward

reach distance measured using SRT from 1st Day to 3rd Week and end of the 5th Week of intervention.

- **RENALD** et al (2016) revealed that Swiss ball training gave more significant improvement in trunk control than bed exercises among hemiparetic patients. So it concluded that Swiss ball exercises showed a significant change in both dynamic sitting balance and co-ordination in patients with trunk impairements.

2.4 STUDY ON TRUNK IMPAIREMENT SCALE:

- **G.VERHEYDEN** et al .,(2003) the study was conducted on 28 patients in rehabilitating setting ,two physiotherapist observed each patient and scored independently and Spearman rank correlations was done to examine reliability and clinical parameters supports the use of Trunk Impairement Scale in clinical use and in stroke research.The test –retest and interobserver reliability for the TIS score was 0.96 and 0.99 respectively.

2.5 STUDY ON BERG BALANCE SCALE :

- **SUSAN W.MUIR-HUNTER** et al.,conducted a study on reliability of the berg balance scale as a clinical measure of balance in community dwelling older adults with mild to moderate and the study concluded that the BBS achieved relative reliability values that support its utility.

AIMS & OBJECTIVES

3.AIM AND OBJECTIVES

3.1 AIM OF THE STUDY:

- Effectiveness of Task Oriented Swiss ball training on trunk control and functional balance in patients with MCA stroke.

3.2 OBJECTIVES:

- To find the effectiveness of task oriented swiss ball training on trunk control and functional balance in patients with MCA stroke.
- To find the effectiveness of Conventional therapy on trunk control and functional balance in patients with MCA stroke.
- To compare the effectiveness of task oriented Swiss ball training on trunk control and functional balance in patients with MCA stroke.

METHODOLOGY

4. MATERIALS ANDMETHODOLOGY

4.1 STUDY DESIGN:

- Quasi Experimental Study.

4.2 STUDY POPULATION :

- MCA stroke patients.

4.3 SAMPLING METHOD:

- Purposive Sampling.

4.4 SAMPLE SIZE:

- 18 MCA stroke patients.
- GROUP A :9 patients treated with Task Oriented Swiss ball Training.
- GROUP B :9 patients treated with Conventional exercise

4.5 STUDY SETTING:

- Department of Physical Medicine and Rehabilitation ,Kovai Medical Center and Hospital-Coimbatore.

4.6 STUDY DURATION:

- One hour per session.
- One session a day.
- Four sessions per week for 6 weeks.

4.7 STUDYCRITERIA:

4.7.1 INCLUSION CRITERIA:

- Subjects with MCA stroke Clinically diagnosed and conformed by CT or MRI scan
- Patients included during acute and sub acute phase.
- Both men and women are eligible for the study
- Age group between 40 to 60 years

4.7.2 EXCLUSION CRITERIA:

- Recurrent stroke
- Neurological diseses affecting balance other than stroke :
    - Cerebellar disease
    - Parkinson disease
    - Vestibular lesion
- Musculoskeletal disorders affecting motor performance of lower limbs:
    - Low back ache
    - Arthritis or degenerative diseases of lower limb
- Patients with vital signs unstable
- Severe Visual and Auditory deficits

4.8 HYPOTHESES:

4.8.1 NULL HYPOTHESES:

Ho1: There is no significant difference in Trunk control in Group A before and after the Task Oriented Swiss ball Training.

Ho2: There is no significant difference in Trunk control in Group B before and after the Conventional therapy.

Ho3: There is no significant difference in Trunk control between Group A & Group B before the specific intervention.

Ho4: There is no significant difference in Trunk control between Group A & Group B after the specific intervention.

Ho5: There is no significant difference in Functional Balance in Group A before and after the Task Oriented Swiss ball Training.

Ho6: There is no significant difference in Functional Balance in Group B before and after the Conventional Exercise.

Ho7: There is no significant difference in Functional Balance between Group A & Group B before the specific intervention.

Ho8: There is no significant difference in Functional Balance between Group A &Group B after the specific intervention.

4.8.2 ALTERNATE HYPOTHSES:

H1: There is significant difference in Trunk control in Group A before and after the Task Oriented Swiss ball Training.

H2: There is significant difference in Trunk control in Group B before and after the Conventional therapy.

H3: There is significant difference in Trunk control between Group A & Group B before the specific intervention.

H4: There is significant difference in Trunk control between Group A & Group B after the specific intervention.

H5: There is significant difference in Functional Balance in Group A before and after the Task Oriented Swiss ball Training.

H6: There is significant difference in Functional Balance in Group B before and after the Conventional Exercise.

H7: There is significant difference in Functional Balance between Group A & Group B before the specific intervention.

H8: There is significant difference in Functional Balance between Group A &Group B after the specific intervention.

4.9 OUTCOME MEASURE:

- Trunk control.
- Functional balance.

4.10 TOOLS USED:

- Trunk Impairment Scale.
- BergBalance Assessment.

4.11 INTERVENTION:

The total number of 18 subjects who fulfilled the selection criteria were randomly divided into two groups.

GROUP A :

Swiss ball training with conventional physiotherapy was administered to subjects for 4 times a week for 6 weeks. At the beginning of treatment program ,5 minutes warm up exercises were given. Intermittent rest periods were conducted between each set of exercise. At the end of training program cool down exercises were carried out. During exercise sessions subjects were monitored and supervised with an adequate care to avoid the risk of falls or fracture.

WARM –UP : a) 5 minutes brisk walking. b) Mild stretching : Hamstring stretch, gluteus maximus stretch, quadriceps stretch , gastronemius& soleus stretch , trapezius & deltoid stretch, biceps , triceps, erector spinae , latissimus dorsi and rhomboids stretch, paraspinal stretch. (5 repetitions and 10 seconds hold).

Swiss ball training protocols included: Swiss ball training includes supine exercises, sitting exercises, Standing exercises, Prone exercises, Trunk rotations, Swiss ball core stability

enhancing exercises, Swiss ball balance and co-ordination exercises. Conventional physiotherapy interventions included Stretching & strengthening exercises, PNF techniques, icing, passive movements & gait training. Supine exercises: Bridging (hamstring curl)

Lower trunk rotation Bridging: Patient is asked to lie down on mat in supine position. With hip flexed and knee extended, patient's legs are kept on Swiss ball. Patient is asked to lift off the pelvis with the Swiss ball placed under knees, then slowly and progressively the ball is placed under the foot, in order to increase the ability to maintain balance. The position is maintained for 10sec.

Lower trunk rotations: In supine lying, with both the lower limbs supported on the Swiss ball. Then in crook lying position patient is asked to move the knees and rotate the pelvis on either sides. Slowly the position of Swiss ball is shifted from knees to foot end in order to gain more control.

PRONE EXERCISES:

Swiss ball opposite arm and leg lift · Back extension (abdomen supported on ball) or T-raise

Swiss ball opposite arm and leg lift: In prone position, patient lies down on belly-side, so that the navel is over the center of Swiss ball and trunk is supported. Initially both hands and feet are supported on floor. Then slowly patient lifts his alternate one arm and one leg (right arm and left leg) and maintains the position for 10 sec.

Back extension: In prone position, patient lies on the ball with umbilicus over the center of Swiss ball. Initially the upper body was relaxed and both feet were in contact with the floor. Then, both hands were kept behind the head with both feet on ground and patient was asked to lift the upper body up and extend his back. The position was maintained progressively for 5-10 sec.

SITTING EXERCISES:

Trunk flexion and extension · Static sitting balance · Swiss ball rocking · Trunk lateral flexion · Front and back bending · Forward reach · Lateral reach

Trunk flexion & extension: In sitting position on Swiss ball, initially patient is asked to flex and extend the trunk without moving the forwards or backwards. Then patient is asked to flex and extend his lumbar spine. slight rotations of the trunk also occur with flexion and extension.

Static sitting balance: The patient is told to sit firm on the Swiss ball and asked to maintain a correct back posture and balance with both the feet on the ground. Position is maintained for 10 sec.

Swiss ball rocking: Patient is made to sit on the Swiss ball and asked to rock (bounce) the pelvis and hips from side to side, front to back, up & down or in circular direction.

Trunk lateral flexion: In sitting position on Swiss ball, patient is asked to laterally flex his trunk. Upper and lower trunk lateral flexion initiates with the movement of shoulder and pelvis girdle.

Front and back bending: In sitting position on Swiss ball, with clasped hands position the patient is asked to bend the trunk forward and backward.

Forward reach: In sitting position on Swiss ball, patient is asked to reach the object in forward direction. So when the patient reaches forward towards the object, rotations also occur with the trunk flexion.

Lateral reach: In sitting position on Swiss ball, patient is asked to reach the object by flexing his trunk laterally

STANDING EXERCISES : Wall squatting exercises (swiss ball squats) with knees in extension

Wall squat with knees bending Swiss ball wall squats with knee extension: patient is asked to Stand and hold the swiss ball behind the back, so that the swiss ball should get pressed between the wall and patient's back. Keep the little distance between both the feets so that body can maintain balance. Maintain the position for 10sec. Swiss ball wall squats with knee bending: Initailly, Patient is asked to stand and hold the swiss ball behind his back. Then patient is asked to slowly bend his knees with the ball supported where the ball is pinned between wall and patient's back. Maintain the position with bent knees for 10 sec.

COOL DOWN: 5 Minutes walking, Light stretching - hip extensor and hip flexor stretch, Gastrocnemius and soleus stretch, core muscle stretch ,Paraspinal stretch (5 repetitions and 10 seconds hold). The swiss ball training were performed with 10 repetitions , 3 sets of each segment, for 45 min per session.

GROUP B:

The patients in the control group received only the following conventional treatment for 45 minutes per day for 4 sessions in a week.

Active assisted/passive range of motion exercises for the affected limbs.

Manual stretching exercises for tightened structures of paralytic limb, each stretch held for 30 seconds, repeated 3 times.

Strengthening exercise,if torrelable for the affected side using sandbags.10 RM was used ,3 sets of 10 repetitions for all major muscle groups of paretic upper limb and lower limb.

Weight bearing eaxercises for the paretic upper limb for 3 to 5 minutes in high sitting.

Electrical stimulation for affected limb musculature, if required including deltoid,triceps,wristextensors,Quadriceps and Ankle dorsiflexor using surged faradic current,6 minutes per muscle group. Moderate intensity was given which eicited a visible muscle contaction on/;off ratio was set to 5:8 sec.

Balance training using wobble board or swiss ball is indicated for 10 minutes

Gait training with assistance in parallel bar.

4.12 PHOTO PRESENTATION:

GROUP A TASK ORIENTED TRAINING

Fig 1 FORWARD REACH

Fig 2 QUADRIPOD ARM LIFT

Fig 3 LATERAL REACH

GROUP B CONVENTIONAL THERAPY

Fig 4 ELECTRICAL STIMULATION

4.12 STATISTICAL METHOD AND FORMULA:

Paired 't' test:

To measure the difference between the pre test and post test values.

$$t = \frac{\bar{d}\sqrt{n}}{SD}$$

SD=

$$\sqrt{\frac{\sum(d-\bar{d})^2}{n-1}}$$

$\bar{d}$ =calculated mean difference between pre-test & post-test values.

d = difference between pre-test and post-test values

n = sample size.

SD = Standard Deviation

Independent't' test :To measure the difference between the post values

$$SD = \sqrt{\frac{\sum (d_1 - \bar{d}_1)^2 + \sum (d_2 - \bar{d}_2)^2}{(n_1 + n_2) - 2}}$$

$$t = \frac{\bar{d}_1 - \bar{d}_2}{SD} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

$\bar{d}$ =calculated mean difference between pre-test & post-test values

d= difference between pre-test and post- test values

n= sample size

DATA PRESENTATION

5.DATA PRESENTATION

5.1 TABULAR REPRESENTATION

Paired‘t’ test analysis for Pretest and Posttest values of group A and Group B

TRUNK IMPAIREMENT SCALE

Outcome		Mean value		Calculated ‘t’ value	Table ‘t’ value	P value and level of significance
		pretest	posttest			
TRUNK IMPAIRMENT SCALE	Group A	83	166	2.306	2.11	P<0.05 SIGNIFICANT
	Group B	85	152	12.28	2.11	P<0.05 SIGNIFICANT

BERG BALANCE SCALE

Outcome		Mean value		Calculated ‘t’ value	Table ‘t’ value	P value and level of significance
		pretest	posttest			
BERG BALANCE SCALE	Group A	298	413	7.98	2.11	P<0.05 SIGNIFICANT
	Group B	295	417	15.45	2.11	P<0.05 SIGNIFICANT

Independent‘t’ test analysis for Pretest and Posttest values of group A and Group B

TRUNK IMPAIRMENT SCALE

Outcome		Mean value		Calculated ‘t’ value	Table ‘t’ value	P value and level of significance
		Group A (Experimental)	Group B (Control)			
TRUNK IMPAIRMENT SCALE	Pretest	5.4	9.4	0.74	2.12	P<0.05 and not SIGNIFICANT
	Posttest	19	16	1.39	2.12	P<0.05 and not SIGNIFICANT

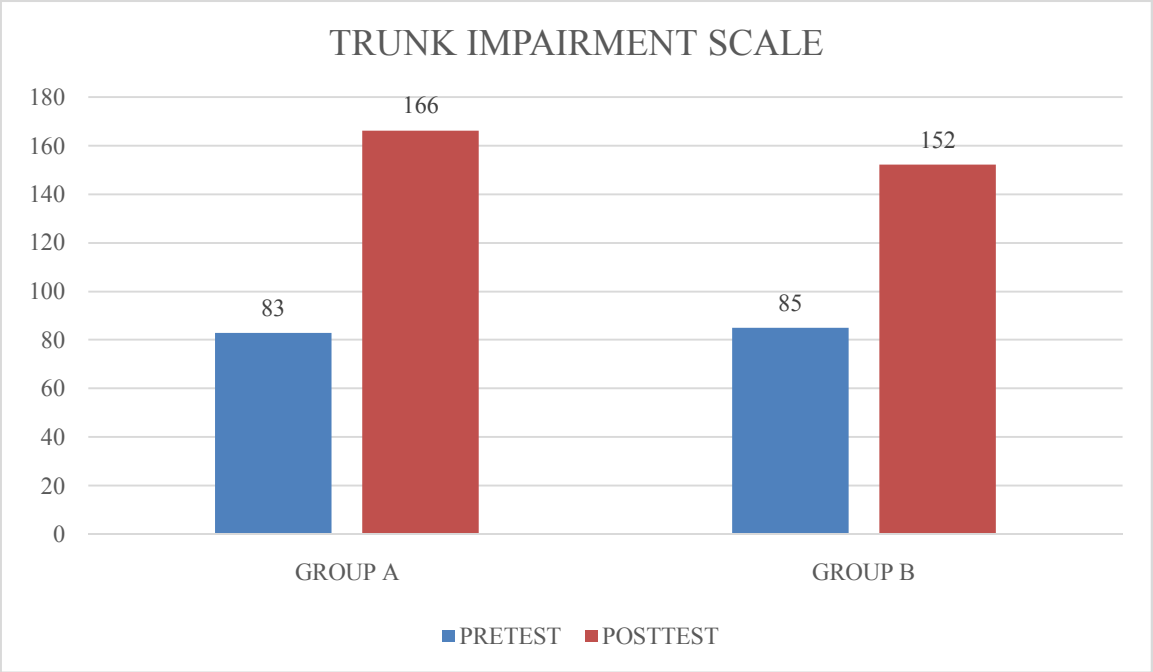
BERG BALANC SCALE

Outcome		Mean value		Calculated ‘t’ value	Table ‘t’ value	P value and level of significance
		Group A (Experimental)	Group B (Control)			
BERG BALANCE SCALE	Pretest	32	32.7	0.36	2.12	P<0.05 and not SIGNIFICANT
	Posttest	45.88	46.33	7.12	2.12	P<0.05 SIGNIFICANT

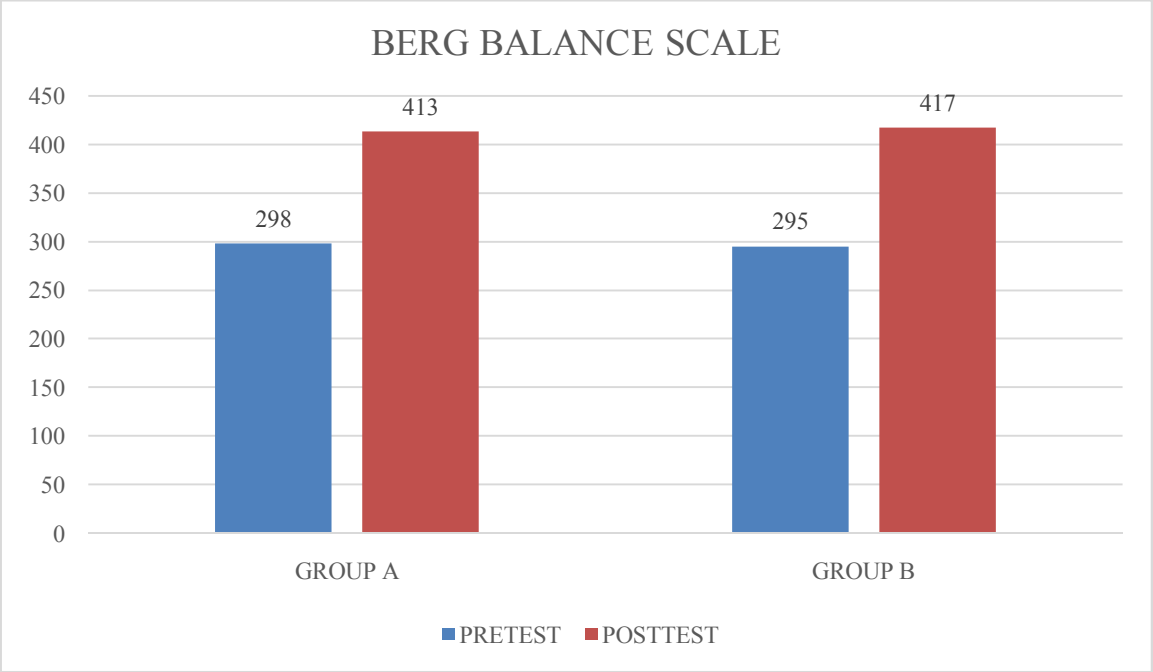
5.2 GRAPHICAL PRESENTATION

5.2.1 Paired‘t’ test analysis for Pretest and Posttest values of group A and Group B

TRUNK IMPAIREMENT SCALE

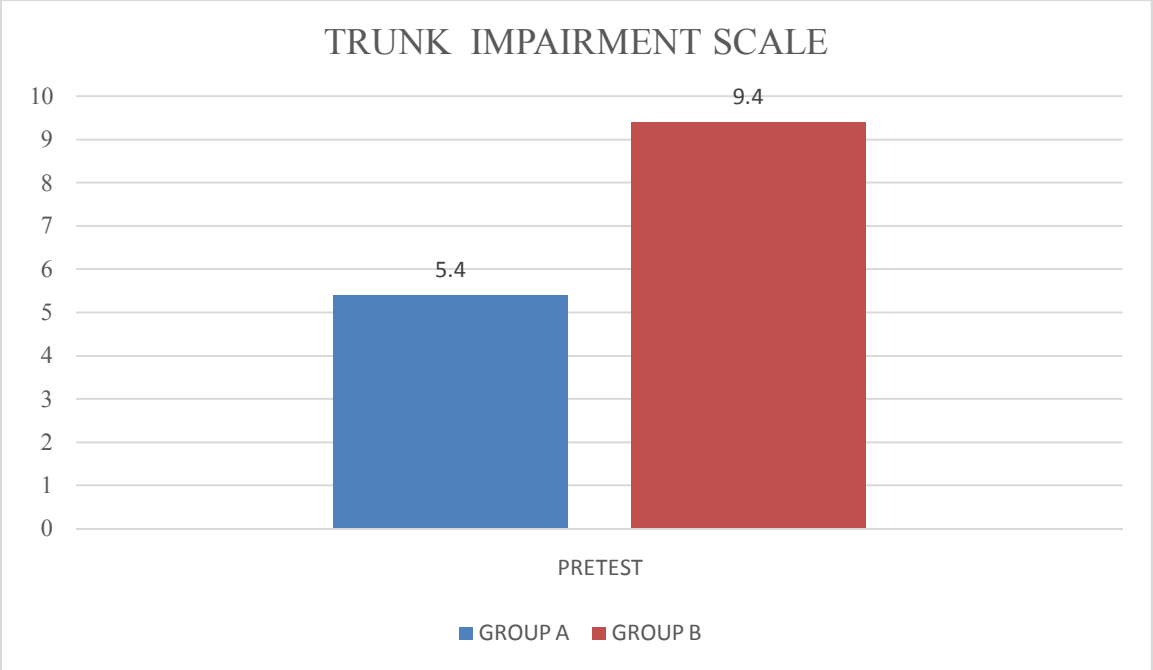


BERG BALANCE SCALE



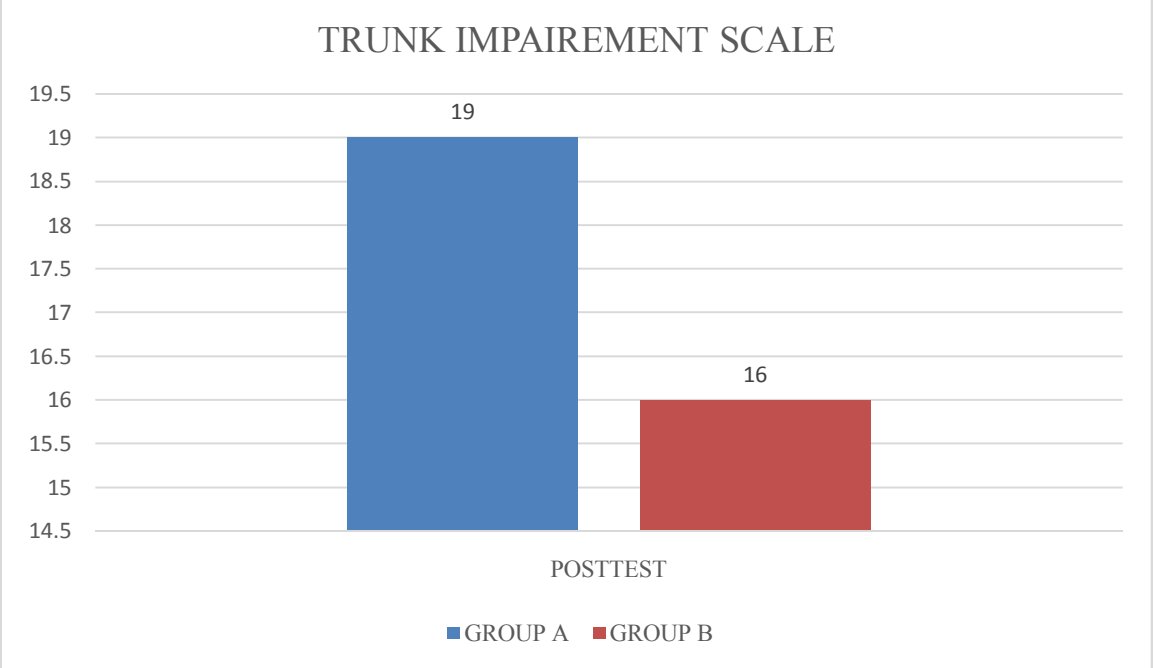
5.2.2 Independent ‘t’ test analysis for Pretest values of group A and Group B

TRUNK IMPAIREMENT SCALE



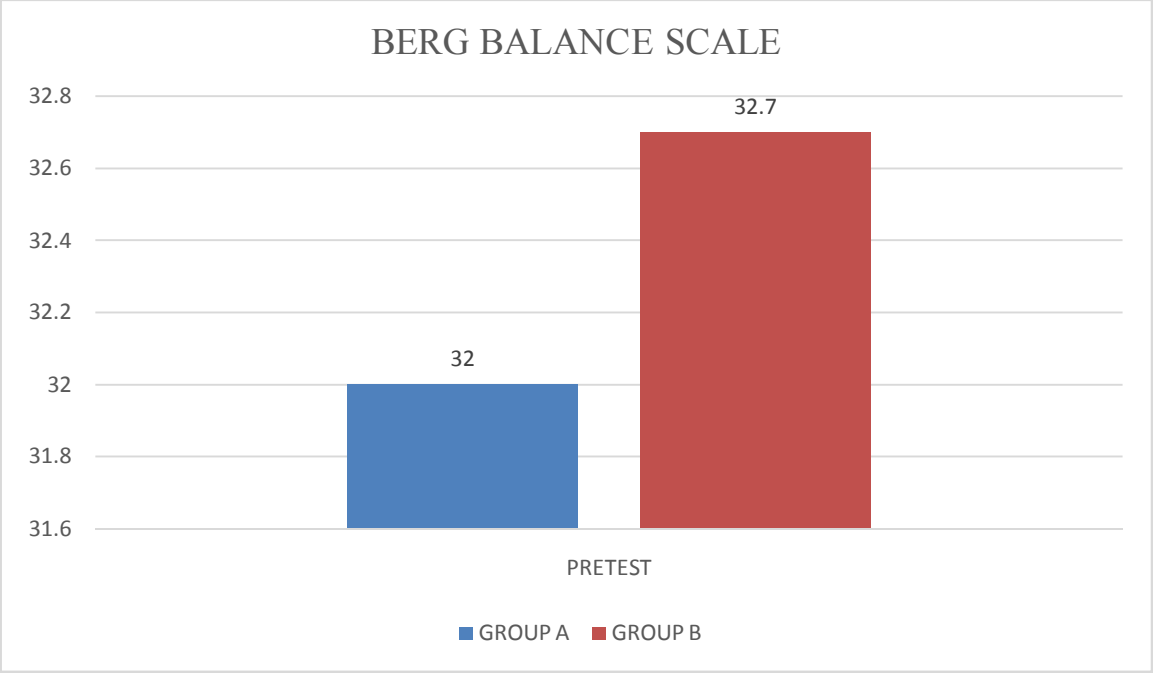
Independent ‘t’ test analysis for Posttest values of group A and Group B

TRUNK IMPAIREMENT SCALE



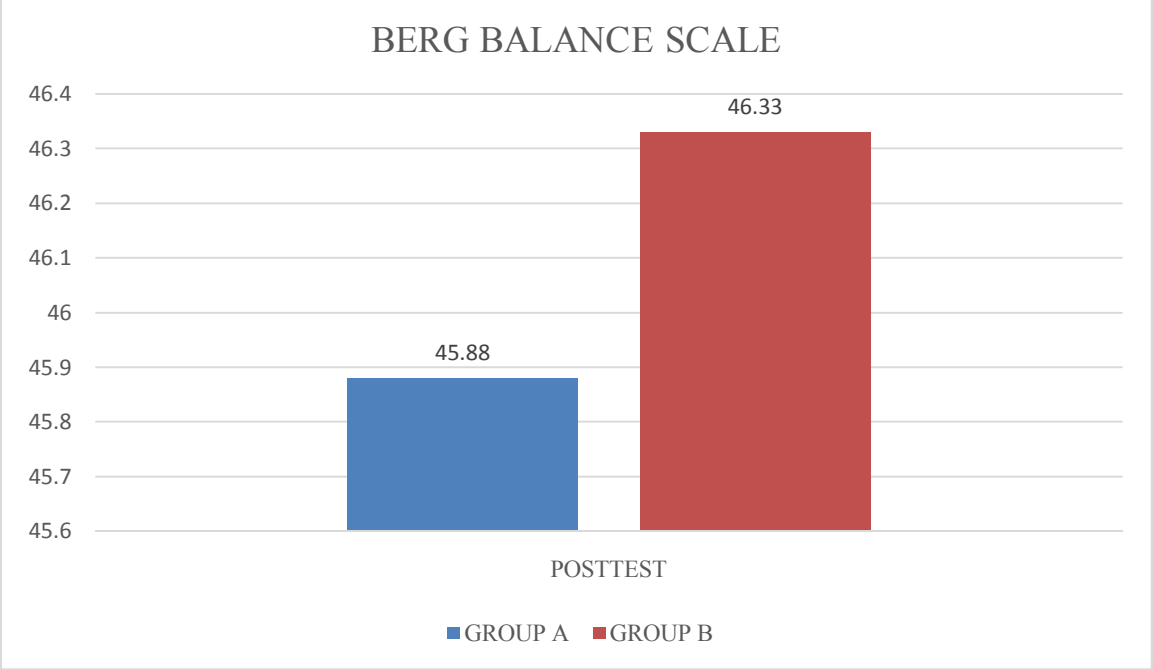
Independent ‘t’ test analysis for Pretest values of group A and Group B

BERG BALANCE SCALE



Independent ‘t’ test analysis for Posttest values of group A and Group B

BERG BALANCE SCALE



5.3 RESULTS

The differences between two groups were analysed using Independent‘t’ test and the difference within the group by means of paired‘t’test.

PAIRED ‘t’ TEST

Trunk impairment scale{Group A}

In the Experimental Group A, to find out the significant difference between pre test and post test, paired ‘t’ test was calculated for a degrees of freedom (df 8) at 5% level of significance. The calculated ‘t’ value is 2.306 and table value is 2.11. Thus, the calculated ‘t’ value is greater than the table value. Hence, the null hypothesis is rejected and proved that there is significant difference between pre test and post test values of TIS in group A.

Berg balance scale{Group A}

In the Experimental Group A, to find out the significant difference between pre test and post test, paired ‘t’ test was calculated for a degrees of freedom (df 8) at 5% level of significance. The calculated ‘t’ value is 7.98 and table value is 2.11. Thus, the calculated ‘t’ value is greater than the table value. Hence, the null hypothesis is rejected and proved that there is significant difference between pre test and post test values of BBS in group A.

Trunk impairment scale{Group B}

In the Control group B, to find out the significant difference between pre test and post test, paired ‘t’ test was calculated for a degrees of freedom (df 8) at 5% level of significance. The calculated ‘t’ value is 12.28 and table value is 2.11.Thus, the calculated ‘t’ value is greater than the table value. Hence, the null hypothesis is rejected and proved that there is significant difference between pre test and post test values of TIS in group B.

Berg balance scale{Group B}

In the Control group B, to find out the significant difference between pre test and post test, paired ‘t’ test was calculated for a degrees of freedom (df 8) at 5% level of significance. The

calculated ‘t’ value is 15.45 and table value is 2.11.Thus, the calculated ‘t’ value is greater than the table value. Hence, the null hypothesis is rejected and proved that there is significant difference between pre test and post test values of BBS in group B.

INDEPENDENT ‘t’ TEST

PRE TEST VERSUS PRE TEST

Trunk impairment scale

To find out the significant difference in the pre test scores of experimental group and Control group Independent ‘t’ test was calculated for a degrees of freedom (df 16) at 5% level of significance. The calculated ‘t’ value is 0.74 and table value is 2.12. Thus, the calculated ‘t’ value is less than the table value. Hence, the null hypothesis is accepted and there is no significant difference in the pre test TIS score between Experimental group and Control group. Thus , the Homogenity is maintained between the groups.

Berg balance scale

To find out the significant difference in the pre test scores of experimental group and Control group Independent ‘t’ test was calculated for a degrees of freedom (df 16) at 5% level of significance. The calculated ‘t’ value is 0.36 and table value is 2.12. Thus, the calculated ‘t’ value is less than the table value. Hence, the null hypothesis is accepted and there is no significant difference in the pre test BBS score between Experimental group and Control group. Thus , the Homogenity is maintained between the groups.

POST TEST VERSUS POST TEST

Trunk impairment scale

To find out the significant difference in the post test scores of experimental group and Control group Independent ‘t’ test was calculated for a degrees of freedom (df 16) at 5% level of significance. The calculated ‘t’ value is 1.39 and table value is 2.12. Thus, the calculated ‘t’ value is less than the table value. Hence, the null hypothesis is accepted and there is no significant difference in the post test TIS score between Experimental group and Control group. Thus , the Homogenity is maintained between the groups.

Berg balance scale

To find out the significant difference in the pre test scores of experimental group and Control group Independent ‘t’ test was calculated for a degrees of freedom (df 16) at 5% level of significance. The calculated ‘t’ value is 7.12 and table value is 2.12. Thus, the calculated ‘t’ value is more than the table value. Hence, the null hypothesis is rejected and there is significant difference in the pre testBBS score between Experimental group and Control group.

DISCUSSION

6.DICSUSSION

Stroke is a neurological disorder which causes damage to brain.It is a major health problem which needs a significant rehabilitation programmme.Stroke is also known as cerebral vascular accident or brain attack or apoplexy.

SURESHKUMAR KAMALAKANNAN et al(2017) found out that the cumulative incidence of stroke ranged from 105 to 152/100000 persons per day and the crude prevalence of stroke ranged from 44.29 to 559/100000 persons in different parts of the country during the past decade.

Middle Cerebral Artery Stroke is the sudden onset of focal neurological deficit resulting from brain infarction (or) ischaemia in the territory supplied by the MCA. The areas supplied by the MCA are trunk,arm and head.

BO HYUN KIM et al.,(2011) formulated a study the experimental group showed significant improvement in trunk control ability, balance and gait after 4 weeks of task oriented training.The level of significance for TIS for the intervention between the experiment and the control group is $p<0.05$

KANIKA D. MUNIYAE in his study using Graph Pad version3.0, the considered p value for BBS & TUG was > 0.05 where they obtained value was $p < 0.0001$, which was statistically significant.And they concuded that the Effect of Swiss ball training & conventional physiotherapy were effective to improve balance & mobility and also showed a better quality of life in post stroke patients.

In the current study, twenty subjects with MCA stroke who met the inclusion criteria were selected and assigned into two groups. Group A were given Task oriented Swiss ball training , Group B were given conventional physiotherapy.

Although there were many exercises given for MCA stroke patients; task oriented training with swiss ball were encouraged in clinical practice for recent years.

The study found significant difference in trunk control measured by Trunk Impairment Scale and functional balance measured by Berg Balance Scale.

Recorded values were analysed and interpret using paired 't' test and independent 't' test. Paired't' test was used to interpret the results within the group before and after the intervention and independent 't' test was used to interpret the results between the groups. When pre-test and post-test within the groups were analysed using paired 't' test there is significant difference in both the groups and when both groups were analysed by independent't'test, the post-test value of trunk impairement scale statistically not significant and berg balance scale showed statistically significant difference, but the pretest-test values of both trunk impairement scale and berg balance showed statistically not significant. When the mean values are compared, there is improvement within groups but comparatively there is no differences between groups for trunk impairement scale and significant differences between groups for functional balance for MCA stroke patients.

The trunk exercise performed on the physio ball are more effective than of other exercise and it is useful for trunk rehabilitation in patients with acute stroke.The treatment system were based on task specific system and ecological motor control theory.

The result of this study demonstrated that effectiveness of Task oriented training with Swiss ball increases the trunk balance and functional balance when compare to conventional therapy. But there was no significant difference in trunk balance between the groups and the study proven that both the intervention are effective in improving the functional balance of patients with MCA stroke..

SUMMARY & CONCLUSION

7.SUMMARY AND CONCLUSION

SUMMARY

- The study evaluated the effect of task oriented swiss ball training on trunk control and functional balance in patients with MCA stroke.
- 18 subjects who met the selection criteria were randomly assigned to two groups –Group A, Group B. Group A were given Task oriented swiss ball training and Group B were given conventional physiotherapy interventions.
- The pre-test and post-test data were collected for Trunk Impairment scale (TIS) and Berg Balance Scale (BBS) .The difference between two Groups were analyzed using Independent 't' test and the difference within the groups were analyzed using paired 't' test.

CONCLUSION

- The study showed a significant improvement in both the groups. So, this study concluded that Task oriented Swiss ball training are effective to improve trunk control and functional balance among the patients with MCA stroke.

LIMITATIONS &SUGGESTIONS

8.LIMITATIONS AND SUGGESTIONS

LIMITATIONS

- Small sample size was taken.
- The duration of the study was only 6 weeks.
- The study was limited with specific age group 40 to 60 years.
- Only MCA stroke patients were taken in the study.

SUGGESTIONS

- Study can be done on larger sample.
- Similar studies can be done on longer duration.
- The future studies samples can also be selected from other age groups.
- Various outcome measures can be included.
- Gender based study can also be done.
- Future studies can be carried in cerebellar disease,traumatic brain injury,Parkinson disease .

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APPENDICES

10.APPENDICES

APPENDIX -I

CONSENT FORM

I …… Voluntarily consent to participate in the research study,**"EFFECTIVENESS OF TASK ORIENTED SWISS BALL TRAINING ON TRUNK CONTROL AND FUNCTIONAL BALANCE IN PATIENTS WITH MCA STROKE**".The researcher has explained me the treatment approach in brief, risk of participation and has answered the question related to the research to my satisfaction.

Participant signature :

Signature of witness :

Signature of researcher :

APPENDIX - II

ASSESSMENT PERFOMA

Name:

Age:

Gender:

Register no:

Date of admission:

Date of assessment:

Height:

Weight:

BMI:

Address:

Referred doctor:

Present medical history:

Past medical history:

Vitals:

BP:

Pulse:

Respiratory rate:

SpO2:

Temperature:

Affected side:

Participant group:

Outcome measures:

Trunk Impairment Scale

Pre test	
Post test	

Berg Balance Scale

Pre test	
Post test	

SIGNATURE OF THE PHYSIOTHERAPIST:

APPENDIX – III

TRUNK IMPAIRMENT SCALE

Appendix – Trunk Impairment Scale (TIS)

The starting position for each item is the same. The patient is sitting on the edge of a bed or treatment table without back and arm support. The thighs make full contact with the bed or table, the feet are hip width apart and placed flat on the floor. The knee angle is 90°. The arms rest on the legs. If hypertonia is present the position of the hemiplegic arm is taken as the starting position. The head and trunk are in a midline position.
If the patient scores 0 on the first item, the total score for the TIS is 0.
Each item of the test can be performed three times. The highest score counts. No practice session is allowed.
The patient can be corrected between the attempts.
The tests are verbally explained to the patient and can be demonstrated if needed.

Item			
	Static sitting balance		
1	Starting position	Patient falls or cannot maintain starting position for 10 seconds without arm support	☐ 0
		Patient can maintain starting position for 10 seconds If score = 0, then TIS total score = 0	☐ 2
2	Starting position Therapist crosses the unaffected leg over the hemiplegic leg	Patient falls or cannot maintain sitting position for 10 seconds without arm support	☐ 0
		Patient can maintain sitting position for 10 seconds	☐ 2
3	Starting position Patient crosses the unaffected leg over the hemiplegic leg	Patient falls	☐ 0
		Patient cannot cross the legs without arm support on bed or table	☐ 1
		Patient crosses the legs but displaces the trunk more than 10 cm backwards or assists crossing with the hand	☐ 2
		Patient crosses the legs without trunk displacement or assistance	☐ 3
		Total static sitting balance	/7
	Dynamic sitting balance		
1	Starting position Patient is instructed to touch the bed or table with the hemiplegic elbow (by shortening the hemiplegic side and lengthening the unaffected side) and return to the starting position	Patient falls, needs support from an upper extremity or the elbow does not touch the bed or table	☐ 0
		Patient moves actively without help, elbow touches bed or table If score = 0, then items 2 and 3 score 0	☐ 1
2	Repeat item 1	Patient demonstrates no or opposite shortening/lengthening	☐ 0
		Patient demonstrates appropriate shortening/lengthening If score = 0, then item 3 scores 0	☐ 1
3	Repeat item 1	Patient compensates. Possible compensations are: (1) use of upper extremity, (2) contralateral hip abduction, (3) hip flexion (if elbow touches bed or table further then proximal half of femur), (4) knee flexion, (5) sliding of the feet	☐ 0
		Patient moves without compensation	☐ 1
4	Starting position Patient is instructed to touch the bed or table with the unaffected elbow (by shortening the unaffected side and lengthening the hemiplegic side) and return to the starting position	Patient falls, needs support from an upper extremity or the elbow does not touch the bed or table	☐ 0
		Patient moves actively without help, elbow touches bed or table If score = 0, then items 5 and 6 score 0	☐ 1
5	Repeat item 4	Patient demonstrates no or opposite shortening/lengthening	☐ 0
		Patient demonstrates appropriate shortening/lengthening If score = 0, then item 6 scores 0	☐ 1

Item			
6	Repeat item 4	Patient compensates. Possible compensations are: (1) use of upper extremity, (2) contralateral hip abduction, (3) hip flexion (if elbow touches bed or table further then proximal half of femur), (4) knee flexion, (5) sliding of the feet	☐ 0
		Patient moves without compensation	☐ 1
7	Starting position Patient is instructed to lift pelvis from bed or table at the hemiplegic side (by shortening the hemiplegic side and lengthening the unaffected side) and return to the starting position	Patient demonstrates no or opposite shortening/lengthening	☐ 0
		Patient demonstrates appropriate shortening/lengthening If score = 0, then item 8 scores 0	☐ 1
8	Repeat item 7	Patient compensates. Possible compensations are: (1) use of upper extremity, (2) pushing off with the ipsilateral foot (heel loses contact with the floor)	☐ 0
		Patient moves without compensation	☐ 1
9	Starting position Patient is instructed to lift pelvis from bed or table at the unaffected side (by shortening the unaffected side and lengthening the hemiplegic side) and return to the starting position	Patient demonstrates no or opposite shortening/lengthening	☐ 0
		Patient demonstrates appropriate shortening/lengthening If score = 0, then item 10 scores 0	☐ 1
10	Repeat item 9	Patient compensates. Possible compensations are: (1) use of upper extremities, (2) pushing off with the ipsilateral foot (heel loses contact with the floor)	☐ 0
		Patient moves without compensation	☐ 1
		Total dynamic sitting balance	/10
	Co-ordination		
1	Starting position Patient is instructed to rotate upper trunk 6 times (every shoulder should be moved forward 3 times), first side that moves must be hemiplegic side, head should be fixated in starting position	Hemiplegic side is not moved three times	☐ 0
		Rotation is asymmetrical	☐ 1
		Rotation is symmetrical If score = 0, then item 2 scores 0	☐ 2
2	Repeat item 1 within 6 seconds	Rotation is asymmetrical	☐ 0
		Rotation is symmetrical	☐ 1
3	Starting position Patient is instructed to rotate lower trunk 6 times (every knee should be moved forward 3 times), first side that moves must be hemiplegic side, upper trunk should be fixated in starting position	Hemiplegic side is not moved three times	☐ 0
		Rotation is asymmetrical	☐ 1
		Rotation is symmetrical If score = 0, then item 4 scores 0	☐ 2
4	Repeat item 3 within 6 seconds	Rotation is asymmetrical	☐ 0
		Rotation is symmetrical	☐ 1
		Total co-ordination	/6
		Total Trunk Impairment Scale	/23

APPENDIX –IV

BERG BALANCE SCALE

General Instructions:

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

_____ 1. SITTING TO STANDING

Instructions: Please stand up. Try not to use your hand for support.

(4) - Able to stand without using hands and stabilize independently
(3) - Able to stand independently using hands
(2) - Able to stand using hands after several tries
(1) - Needs minimal aid to stand or stabilize
(0) - Needs moderate or maximal assist to stand

_____ 2. STANDING UNSUPPORTED

Instructions: Please stand for two minutes without holding on.

(4) - Able to stand safely for 2 minutes
(3) - Able to stand 2 minutes with supervision
(2) - Able to stand 30 seconds unsupported
(1) - Needs several tries to stand 30 seconds unsupported
(0) - Unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

_____ 3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL

Instructions: Please sit with arms folded for 2 minutes.

(4) - Able to sit safely and securely for 2 minutes
(3) - Able to sit 2 minutes under supervision
(2) - Able to able to sit 30 seconds
(1) - Able to sit 10 seconds

(0) - Unable to sit without support 10 seconds

_____ 4. STANDING TO SITTING

Instructions: Please sit down.

(4) - Sits safely with minimal use of hands
(3) - Controls descent by using hands
(2) - Uses back of legs against chair to control descent
(1) - Sits independently but has uncontrolled descent
(0) - Needs assist to sit

_____ 5. TRANSFERS

Instructions: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

(4) - Able to transfer safely with minor use of hands
(3) - Able to transfer safely definite need of hands
(2) - Able to transfer with verbal cuing and/or supervision
(1) - Needs one person to assist
(0) - Needs two people to assist or supervise to be safe

_____ 6. STANDING UNSUPPORTED WITH EYES CLOSED

Instructions: Please close your eyes and stand still for 10 seconds.

(4) - Able to stand 10 seconds safely
(3) - Able to stand 10 seconds with supervision
(2) - Able to stand 3 seconds
(1) - Unable to keep eyes closed 3 seconds but stays safely
(0) - Needs help to keep from falling

_____ 7. STANDING UNSUPPORTED WITH FEET TOGETHER

Instructions: Place your feet together and stand without holding on.

(4) - Able to place feet together independently and stand 1 minute safely
(3) - Able to place feet together independently and stand 1 minute with supervision
(2) - Able to place feet together independently but unable to hold for 30 seconds
(1) - Needs help to attain position but able to stand 15 seconds feet together
(0) - Needs help to attain position and unable to hold for 15 seconds

_____ 8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

Instructions: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

(4) - Can reach forward confidently 25 cm (10 inches)
(3) - Can reach forward 12 cm (5 inches)
(2) - Can reach forward 5 cm (2 inches)
(1) - Reaches forward but needs supervision
(0) - Loses balance while trying/requires external support

_____ 9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

Instructions: Pick up the shoe/slipper, which is place in front of your feet.

(4) - Able to pick up slipper safely and easily
(3) - Able to pick up slipper but needs supervision
(2) - Unable to pick up but reaches 2-5 cm (1-2 inches) from slipper and keeps balance independently
(1) - Unable to pick up and needs supervision while trying
(0) - Unable to try/needs assist to keep from losing balance or falling

_____ 10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING

Instructions: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

(4) - Looks behind from both sides and weight shifts well
(3) - Looks behind one side only other side shows less weight shift
(2) - Turns sideways only but maintains balance
(1) - Needs supervision when turning
(0) - Needs assist to keep from losing balance or falling

_____ 11. TURN 360 DEGREES

Instructions: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

(4) - Able to turn 360 degrees safely in 4 seconds or less
(3) - Able to turn 360 degrees safely one side only 4 seconds or less
(2) - Able to turn 360 degrees safely but slowly
(1) - Needs close supervision or verbal cuing
(0) - Needs assistance while turning

_____ 12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED

Instructions: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

(4) - Able to stand independently and safely and complete 8 steps in 20 seconds
(3) - Able to stand independently and complete 8 steps in > 20 seconds
(2) - Able to complete 4 steps without aid with supervision
(1) - Able to complete > 2 steps needs minimal assist
(0) - Needs assistance to keep from falling/unable to try

_____ 13. STANDING UNSUPPORTED ONE FOOT IN FRONT

Instructions: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

(4) - Able to place foot tandem independently and hold 30 seconds
(3) - Able to place foot ahead independently and hold 30 seconds
(2) - Able to take small step independently and hold 30 seconds
(1) - Needs help to step but can hold 15 seconds
(0) - Loses balance while stepping or standing

_____ 14. STANDING ON ONE LEG

Instructions: Stand on one leg as long as you can without holding on.

(4) - Able to lift leg independently and hold > 10 seconds

(3) - Able to lift leg independently and hold 5-10 seconds

(2) - Able to lift leg independently and hold ≥ 3 seconds

(1) - Tries to lift leg unable to hold 3 seconds but remains standing independently.

(0) - Unable to try of needs assist to prevent fall

Maximum Score = 56